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NASA Aviation Safety Reporting System Report No. 14

Ames Research Center and
Aviation Safety Reporting System Office

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Ames Research Center
Moffett Field, California

Aviation Safety Reporting System Office
Battelle's Columbus Laboratories
Mountain View, California

National Aeronautics
and Space Administration

**Scientific and Technical
Information Branch**

1983

NASA AVIATION SAFETY REPORTING SYSTEM

PROGRAM REPORT NO. 14

Ames Research Center

and

Aviation Safety Reporting System Office*

SUMMARY

The report contains four sections which include the following: (1) an ASRS study of pilot- and controller-submitted reports related to the perceived operation of the Air Traffic Control (ATC) system since the 1981 walkout by the controllers' labor organization; (2) a research paper analyzing incidents which occurred during IFR flights by single-pilot crews; (3) a selection of Alert Bulletins issued by ASRS and the responses they have elicited from the FAA and others concerned; and (4) a list of publications produced by ASRS and instructions for obtaining them.

INTRODUCTION

This is the fourteenth in a series of reports based on safety-related incidents submitted to the NASA Aviation Safety Reporting System (ASRS) by pilots, controllers, and, occasionally, other participants in the National Aviation System (refs. 1-13).** ASRS operates under a memorandum of agreement between the National Aeronautics and Space Administration and the Federal Aviation Administration.

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**Previous editions of ASRS Program Reports were entitled "Quarterly Reports."

PILOT-CONTROLLER REACTION TO THE POST-STRIKE ATC SYSTEM

Rex Hardy*

In a broad sense, the primary function of NASA's ASRS is to provide objective surveillance of the National Aviation System. This is a continuing process of identification and information regarding hazardous conditions, procedures, and situations within the system. The daily flow of reports which pilots, air traffic controllers, and other participants in the system have voluntarily submitted to ASRS is analyzed by experienced ASRS staff members alert to detect deviations from safe practice that might indicate new hazards or a decline in the effectiveness of existing safety standards.

Frequently, to amplify or clarify reported information, ASRS analysts initiate telephone "callbacks" to reporters. Following the strike of air traffic controllers in August 1981, it was generally understood that serious alterations in air traffic control procedures would be required; in an effort to monitor the effect of these changes on safety, ASRS callback activity was intensified.

Complaints from pilots of deficiencies in ATC performance were anticipated, particularly during the early days of the strike; however, this did not prove to be the case. Two of the first reports received by ASRS after the commencement of the strike set the tone of many that followed:

> Flights are going smoother than expected – efficient and courteous control. First six days, delays and disruptions were encountered, but generally this was before departure and the rest of the flight is ok. . . .Eyeballs are out the window for traffic watch, but no conflicts apparent.
>
> * * *
>
> . . . traffic has been smooth and professional and ATC control is fantastic. Controllers working are polite and professional and we get direct vectors . . . other pilots report same.

Many ASRS reports are submitted to explain deviations from correct procedure, whether they are caused by the actions of flightcrews or of controllers. In the post-strike period, there has been no evidence cited in the reports of any such occurrences that might be related to strike effects. On the contrary, pilots frequently volunteered information intended to absolve ATC of misfeasance. A pilot, describing his own error a few days following the controller walkout, provided a detailed picture of his impressions of the suddenly altered system.

> Pilot flying technique error was in no way induced by Tower or Approach Control. En route control, approach control and tower control have never been more courteous or professional than they are now. Frequencies are uncluttered, requests for direct-direct are granted courteously, fuel saving altitudes are offered en route, phraseology is studiously correct. We of the scheduled air carriers have never been handled by traffic controllers as proficiently as we now are. Reduced traffic and greater separation is providing more safety than before the strike. We are back to our regular fuel loads with confidence.

Two elements of interest were apparent in the early ASRS callback comments: (1) although the reporters came from widely diverse sections of the country, and from many different pilot groups, they tended to repeat the same sentiments and, to a surprising degree, even the same language; and (2) in most

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reports it was possible to discern a subtle feeling of surprise. It was evident that expectations of less-than-optimum traffic control were not, hapily, being realized. ASRS analysts successfully completed callbacks to 21 flightcrew members who had reported safety-related incidents during the first month (August 1981) of the strike. Seventeen of these reporters spoke in complimentary terms of ATC performance; most indicated that conditions were better than anticipated, and several took pains to exonerate the working controllers of incorrect procedures. The copilot of a large transport, reporting a potential conflict during which evasive action was required to avoid another aircraft at the same altitude, told the analyst:

> We asked Approach if he saw the twin and he had no target . . . . He had been giving good traffic advisories. Traffic Control has been the best I have seen in my 7 years of flying. The controllers are courteous and proficient. We have received none of the needless vectors and hassles we had been enduring before the controllers walked out. This reported incident was definitely not strike-related.

Lack of "hassle" was noted in several callbacks, as was approval of the efficiency of the military-provided substitute controllers:

> . . . Control has generally been excellent and without hassle.

* * *

> On all my recent flights, ATC handling has been very good. I cannot tell supervisor controllers from military or regular controllers. I am telling all my passengers that air traffic control is good, and the skies are safe for our flights.

As the first month drew towards its close, hints of concern over the coming winter weather began to appear, but the reporters generally indicated a strong intention to cooperate, and a resolve to make the system work.

> . . . It is my opinion that both parties have to find a way to allow experienced controllers to get back on the job before bad weather tests the system. We have had a few days of weather in the Minneapolis area and I was expecting trouble with traffic control, but surprisingly the system handled all the IFR traffic with no apparent strain or trouble.

* * *

> . . . The working controllers on the job deserve all the breaks and cooperation we can give them.

* * *

> I notice less harsh words between controllers and pilots than before the strike. It appears that flightcrews are cooperating fully and the cooperation is returned by ATC controllers. This, and the reduced traffic, is making the system work smoothly and efficiently.

* * *

> . . . I find a new spirit of cooperation between controllers and pilots. Everyone is trying hard to make the system work . . . . The incident reported has nothing to do with the strike. I had the same thing happen a time or two before the strike.

Only four first-month pilot reports could be construed as negative in tone; in these there was no consistent theme. In one case controller rudeness was alleged; another suggested that picketing strikers may have influenced controller action. The others mentioned delays and concern about controller experience:

While trying to remonstrate with controller, he replied that he did not have time to talk with me – this in a very irritated voice. I called my dispatch and asked them to call the supervisor in Center and remove this man from controlling. Shortly a new voice was heard on the frequency.

* * *

After landing, I was advised that picketing controllers observed the helicopter pass in close proximity to my aircraft and made a record of it – apparently for reporting to PATCO. Not known why the heli pilot did not follow instructions or why the tower controller did not correct him or say something to him. This may possibly have been because Tower knew he was being monitored by the picketing controllers.

* * *

. . . traffic is delayed despite cut in schedules.

* * *

I think I detect some fatigue in controllers' voices, pace of their delivery, etc., but I may be reading something into this. I do not share the euphoria that I hear other pilots expressing about the conditions of the ATC system. I feel very strongly we should all be extremely alert for aberrations in ATC control. I feel there is much inexperience lying just below the facade or veneer of normal operations.

With the advent of the strike, controller participation in the ASRS report flow declined drastically: one apparent reason among several includes the greatly increased workload in the facilities, which initially required long work days and fewer days off. In addition, there appears to have been an erroneous perception, particularly on the part of supervisors now working regular positions, that the ASRS program was in some way connected with PATCO. Some reduction in air traffic and increased separation standards obviously combined to lower the incidence of reportable occurrences. During August 1981 only four callbacks to controllers were effected. Of these, one was pessimistic in tone, the other three positive.

. . . things in facility are going fine.

* * *

. . . situation is not bad and think they are operating pretty much in normal fashion except for the overtime and no leave condition.

* * *

Since the job action walkout everything seems to be going along well – perhaps better than first anticipated.

* * *

. . . Flow restrictions are often confusing and change daily or hourly. Flight data workload increased. With restrictions on GA operations they often cancel and go VFR even though weather may be marginal. . . .

By September, and continuing in the months that followed, FAA's contingency plans settled into a routine form of operation; the ASRS callback comments continued to reflect predominently the approval of the pilot community. The terms "polite," "courteous," "cooperative" appeared repeatedly in the analyst-pilot conversations to describe the attitude of the controllers. There appeared to be a good-natured acceptance of those aspects of air traffic control which might be considered less than desirable. Most attention was called to ground delays; once airborne, traffic proceeded with little constraint. Certain new problems did, however, emerge.

> Airways in general seem to be operating smoother than before the strike. We get some ground delays, but I have not been in a holding pattern in the air since the strike. Working controllers seem to be doing a very good job. Even in the instance reported the controller was polite and courteous.

* * *

> Since strike, have received long departure delays in northeast section of country, but once airborne, the ATC service seems better and requests for direct route are usually approved. Frequencies are not as congested and controllers seem more cooperative. Reporter anticipates more problems after the onset of winter weather in this section of the country. Reporter is also fighter pilot in the Air National Guard. He says that ATC system very often forces them to operate VFR; also he believes that corporate aircraft are operating VFR in the same altitudes (10,000 to 17,500) and thinks that volume of high-speed VFR traffic is dangerous situation.

The increase in VFR traffic at altitudes previously occupied almost exclusively by aircraft flying IFR was noted by a number of reporters to ASRS; other problems emerged following the strike, but were accepted tolerantly for the most part.

> . . . very concerned about the increase in this type traffic at these altitudes . . . . Except for this type operation of VFR traffic at these altitudes, the ATC system appears to be "doing a hell of a job." Regrets this incident but feels that this occurrence points out an area that requires attention.

* * *

> . . . Although not IFR rated, reporter works with ATC in his area and handling of traffic appears to be well done. The advisory tower concept appears to work fine.

In the preparation of this paper nearly 500 callback summaries were studied; of this number, fewer than 5% indicated an adverse view of the post-strike Air Traffic Control situation. In conversations with flightcrews and controllers, an attitude was perceived that considerably transcended tolerance and acceptance; in fact, reaction to revised conditions can be described as enthusiastic. The same terms occurred repeatedly, with reporters describing the conduct of controllers as "a joy," "fantastic," "superb job," "a pleasure." This "euphoria," which one early reporter viewed as probably to be short-lived, has continued with no perceptible lessening as the tenth month since the walkout has passed.

Only a small number of the pilots and controllers interviewed in ASRS callbacks indicated dissatisfaction with current ATC performance. Some suggestions appeared that training or reduced staffing affected efficiency; concern over long working hours and fewer days off was mentioned occasionally. A few flightcrew reports implied a perception that inexperienced controllers were not working up to expected standards.

It is my impression that the ATC system is operating satisfactorily, but I detect signs of clumsiness on the part of some controllers. There is not the slick polished performsnce I am used to. The working controllers are getting the job done, but the system is not as good as before the strike.

* * *

. . . thinks ATC system has deteriorated. Phraseology not up to standards and services less than satisfactory . . . controller fatigue may be showing up.

These negative flightcrew reports were received relatively early in the post-strike period; few have appeared since January 1982. Negative reports from controllers are conspicuous by their scarcity; those that have appeared relate for the most part to concern over long working periods and the possibility of future fatigue. There are no recent reports that testify to this concern. One controller offered a complaint about supervisors working regular positions; others commended this aspect of the situation.

Supervisors are working control positions to the detriment of supervisory functions, which are apparently lacking, thereby causing discrepancies in ATC coordination between facilities.

* * *

. . . working conditions have never been better. Used to get bored and did not get enough time on positions. . . Morale and work atmosphere are greatly improved, coordination is easier, controllers willingly help each other, and pilot cooperation is much better. . . . Equipment outages and downtime on computer are reduced. . . . Most all of team supervisors were current on positions prior to strike and in few days they were really moving the traffic in much smoother and professional manner than did the controllers who walked out. . . . It is a real revelation and privilege to work alongside these older controllers and supervisors. High morale, improved work atmosphere, and spirit of wanting to do a good job all contribute to making the ATC system "less unsafe" than it was prior to the strike.

A controller report received in the eighth month of the altered system closely echoes the earlier one above.

. . . morale is extremely high; 80% of the controllers have their "old" attitude about service to pilots. New Deputy Chief is working on the other 20% to the delight of the majority . . . .

Two controller reports in April reinforced the perception of good morale and pride in the job.

. . . was supervisor for 10 years. Other controllers are very cooperative and continue to give all possible support. Has a great sense of satisfaction in sitting in the hot seat again . . . .

* * *

. . . have eight new trainees from OK City [FAA's ATC Academy] who are fabulous – smart, eager, motivated, educated, even well dressed – a pleasant change . . . . Hopes to keep all of them.

As the post-strike ATC system nears the end of its first year, it becomes evident that safe, efficient, courteous, and cooperative procedures have become the norm, as perceived by reporters to ASRS. Comment on controller performance has become infrequent, suggesting acceptance of the changed atmosphere – it no

longer warrants remark. This is in strong contrast to the pre-strike era, when ASRS reports were frequently highly critical of ATC performance and controller proficiency and attitude. One of the latest reports received (May 1982) gives one pilot's opinion:

> I personally think ATC controllers are doing great. My opinion is that the airways are safer now than they used to be. I hope there is a lot of training of new people going on, but I do not see any signs of it. If there are trainees on the job, they are performing professionally.

Two flightcrew reports are indicative of a widespread impession that the walkout was, in the long run, beneficial.

> . . . ATC system much better since strike. More teamwork and more professional service. FAA was fortunate that the strike occurred.

* * *

> You have probably heard this 100 times, but the ATC situation (from the very beginning of the job action) has never been better.

With the diminished flow of controller-generated reports to ASRS, a significant substantive change in reports from the facilities became apparent to the analysts: reports of equipment breakdown and failure had virtually disappeared. Prior to the controller walkout, such material aberrations were frequently cited, often in clusters from the same facility. Such reports were usually impatient in tone, suggesting increasing deterioration in computer and radar equipment, and in maintenance of the equipment. There was a strong implication that in some facilities the FAA was allowing the system to deteriorate by ignoring equipment wear and tear, and its maintenance. Since the strike, virtually no such reports have been received. In the absence of any known reason for improved performance of technical components of the ATC, there is a strong inference that many disaffected controllers were zealously trying to stimulate dissension. It seems probable that temporary breakdowns continue to occur, but that the working controllers are coping with such expected events in routine fashion, adapting as necessary to alternative contingency methods of operation. A few reports have commented on the effective maintenance measures in current operations; none of the repetitive complaints in the pre-strike period has been received by ASRS.

ASRS, as a voluntary reporting system, cannot be viewed as an accurate polling establishment; past experience, however, has shown that the general thrust of reported opinions conforms well with the views of the entire pilot and controller communities. The FAA "considers the filing of a report with NASA . . . to be indicative of a constructive attitude." Seen in that light, it is clear that a large majority of pilots and controllers believe that the strike not only was not harmful to safety, but that its effects on the ATC system performance have been beneficial. The repeated hope that ground delays may be reduced as fuller staffing takes place is the only general complaint by flightcrews; controllers look forward to reduced work schedules. With those exceptions, the ASRS data indicate widespread approval of the post-strike ATC system.

OPERATIONAL PROBLEMS EXPERIENCED BY SINGLE PILOTS IN INSTRUMENT METEOROLOGICAL CONDITIONS*

Stacy Weislogel†

INTRODUCTION

This report presents the results of a study of the operational problems experienced by general aviation pilots flying alone on instrument flight rules (IFR) in instrument meteorological conditions (IMC).

General aviation's generation of IFR flight operations is impressive. Instrument operations at airports with FAA Traffic Control Service included 10.6 million air carrier and 19.6 million general aviation operations in 1980. By 1992 the FAA forecasts 12.8 million air carrier (21% increase) and 30.5 million general aviation (56% increase) instrument operations. The number of instrument rated pilots is expected to increase 48% during the same period (ref. 1).

Presently, many single pilot IFR (SPIFR) operations are conducted by highly trained and experienced pilots flying modern, well equipped airplanes. However, a large proportion of the general aviation IFR operations involve relatively inexperienced single pilots, often with limited equipment. The ATC system expects performance at the same level of competency from this proportion of aviation as it does from professional air carrier crews. Aviation agencies and user organizations have expressed concern that the level of competency expected to be demanded of the future SPIFR will not be attained unless significant improvements in the design of the aviation system are achieved. As a result, NASA is conducting a research effort independent of this study to provide the background research, and to develop the technology required to improve the safety and the utility of the single-pilot, general aviation aircraft operating IFR.

OBJECTIVE

The objective of this study was to identify and analytically describe the operational problems reported to the ASRS by the general aviation airman operating as a single pilot in IMC. A further interest was to understand the nature and type of operational problems being experienced by this class of airman, referred to as single pilot IFR, or SPIFR.

SCOPE

This study is based on a review of reports in the ASRS-2 database as of December 10, 1980, for small aircraft, and as of March 18, 1981, for small transport aircraft. For any particular occurrence to be pertinent to this study, it must have met the following requirements. The aircraft must be (1) the type usually flown by a single pilot, (2) operating on an IFR flight plan in IMC, and (3) experiencing an operational problem.

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*This study is an abridged edition of the original ASRS report of the same title which was published as NASA Contractor Report No. 166236 (August, 1981).

†The author is a Professor of Aviation at The Ohio State University and serves as a consultant to the ASRS program.

An operational problem is defined as any occurrence included in the ASRS-2 database in which the safe and/or efficient conduct of a SPIFR flight was adversely affected. With two exceptions,* the occurrences consist of pilots' reports about their own performance, reports by a pilot about the system performance, or reports by an air traffic controller about a pilot's performance.

Although the operational problems identified in this study were reported to be experienced by the SPIFR, they may not be peculiar to this class of airman. Multiple-pilot crews may experience the same operational problems to a greater or lesser extent.

RESULTS AND DISCUSSION

The small aircraft (SMA) document set consists of 95 reports representing 88 occurrences. An occurrence is an independent event which can be reported by more than one observer. The small transport (SMT) document set consists of 41 reports representing 36 occurrences. The SPIFR document set combines the SMA and SMT document sets and consists of 136 reports representing 124 occurrences.

An analysis of each report narrative led to a characterization of the occurrence in terms of how the safe or efficient conduct of the SPIFR flight was adversely affected. On the basis of researcher judgment, 10 categories of operational problems experienced by single pilots in IMC were identified. Each of the categories is examined in detail in the operational problems section. The 10 operational categories are (1) inadequate service, (2) altitude deviation, (3) improperly flown approach, (4) heading deviation, (5) position deviation, (6) below minimums operation, (7) loss of airplane control, (8) mandatory report omission, (9) fuel problem, and (10) improper holding.

Although ASRS data cannot accurately establish the prevalence of a problem, they can often provide convincing evidence that a problem exists. ASRS was designed to provide insights into problems present in the National Aviation System and why such problems exist, thereby pointing to possible solutions for such problems. Thus, ASRS is primarily an analytical, rather than a descriptive, tool (ref. 2).

An analysis of operational problems by reporter and type of operation suggests that professional and nonprofessional pilots are generally experiencing the same types of problems in SPIFR flight. The SMT is typically flown by a professional pilot as was noted in an analysis of operator organization versus type of operation.

The effect of workload on SPIFR operational problems appears in the data. Eighteen percent of SMA and 31% of SMT occurrences are in the initial climb (ICB) and climb (CLB) phases of flight, which include the high workload departure phase. The highest proportion of general aviation IFR accidents occurs in the high workload approach phase. Thirty-six percent of SMA and 31% of SMT occurrences are in the approach (APR) and missed approach (MAP) phases of flight. Although 27% of the SMA and 19% of the SMT occurrences are in the cruise (CRS) phase of flight, the CRS phase is not considered high workload. However, a large percentage of the flight time is in CRS, allowing more time for an operational problem to develop.

Data on total flight time and flight time in the last 90 days suggest that the pilot reporters are experienced pilots, lending additional credibility to the reports which they have contributed to the ASRS. Although the SMT reports are few, the SMT pilot reporter has more flight time and a higher level of recent experience than does the SMA pilot. Over half of the SMA pilots who reported their flight time have

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*One by the USAF, the other by a passenger/pilot.

2,000 hr or more total time, and 50 hr or more in the last 90 days. Similarly, half of the SMT pilots have 4,000 hr or more total time, and over half have 150 hr or more in the last 90 days.

It was concluded, as a result of a statistical test of significance performed by the ASRS staff, that there is no significant difference in the types of operational problems experienced by SMA pilots versus SMT pilots. However, there is a very significant difference in the operation (mission) performed by SMA versus SMT pilots. These findings further support the suggestion that the more experienced pilot is experiencing the same type of SPIFR operational problems as is the less experienced pilot. The significance of this hypothesis, if confirmed, would be that the operational problems experienced by the SPIFR are independent of experience. Effective remedies, therefore, do not lie in improving SPIFR capabilities through more training and experience, but rather in changing the nature of the SPIFR task by redesigning cockpit systems and ATC procedures. An independent study of the general aviation SPIFR operational profile provides a source of information to test this hypothesis more completely (ref. 3).

In summary, the statistical profile of the SPIFR document set presented by the data suggests that (1) the operational problem categories appear to be reasonable, (2) the SMT aircraft are more likely to be flown by experienced professional pilots, (3) the operational problems tend to occur in the high workload phases of flight, and (4) both SMA and SMT pilots are experiencing the same types of operational problems in approximately the same ranking, suggesting that SPIFR operational problems are independent of experience.

Operational Problems

The foregoing general findings suggest that the potential for developing insights into the operational problems experienced by single pilots in IMC is possible through an analysis of the document sets by operational problem category.

Pilot allegations of inadequate service– Pilots and air traffic controllers hold certain expectations about each other's performance and how the various components of the ATC system operate. When a pilot's handling by an air traffic controller is not what the pilot had expected, the pilot is likely to consider the ATC service inadequate. Similarly, if a certain service component does not perform to their expectations, pilots are likely to consider the ATC system inadequate.

The reports showed that pilots' expectations about the performance of controllers and the system are not being satisfied. Pilot allegations of inadequate service comprise the largest category of SPIFR operational problems identified in ASRS-2. Of the 124 occurrences in the document set, 37 (30%) concern inadequate service. These 37 occurrences are distributed among four subcategories: (1) inadequate service from ATC, (2) radio communications reception, (3) aviation weather reporting, and (4) NAVAID problems.

Overall, 23 of the 37 inadequate service occurrences (62%) concerned pilot allegations of inadequate service from ATC, with about the same proportion of occurrences reported in both SMA and the SMT document sets. Allegations of inadequate service because of problems with radio communications reception (5, 14%), aviation weather reporting (5, 14%), and NAVAIDS (4, 11%) make up the balance of the 37 occurrences.

Pilot expectation is a complex matter related to each individual's accumulation of aeronautical experience, knowledge, and skill. Whether a certain expectation is reasonable, valid, or justified must be measured against the system standard of performance, if indeed one exists that can be applied to a specific occurrence. Overall, the pilot's expectations were thought reasonable three times out of four. Although in many cases the pilot may appear merely to be expressing annoyance that his or her expectations were not satisfied, the

safety implications of each can be inferred. Instances where pilot's expectations were judged not reasonable suggest topics for airmen refresher courses and other continuing education programs for pilots.

Altitude deviation (AD)– Altitude deviation occurrences are the second most common category of SPIFR operational problems identified in ASRS-2, accounting for 20% of the document set. Reports of altitude deviations have been submitted by pilots and controllers, although predominantly by the latter (20 of 25 occurrences, or 80%).

The problem of misunderstood clearances is particularly disturbing, given the "readback" redundancy purposely designed into the system to compensate for possible misunderstandings. During the analysis of altitude deviation occurrences, the phenomenon of "mind set" emerged, wherein the pilot apparently selected an altitude from a preconditioning or subsequent intervening event other than that which was assigned. Examples of the mind-set phenomenon include pilots climbing to a flight planned or requested altitude and seeking an altitude assigned to another aircraft.

When it appeared through a close reading of a narrative that a contributing factor, including mind set, could explain why an altitude deviation occurred, it was noted. The mind-set phenomenon was identified in 68% of the altitude deviation occurrences.

Of the 25 SPIFR aircraft involved in altitude deviation occurrences, 15 involved SMA aircraft and 10 involved SMT aircraft. Altitude overshoots accounted for the greatest number of deviations, 17 (68%); followed by premature altitude changes, 3 (12%); altitude undershoots, 2 (8%); altitude maintained, 2 (8%); and altitude excursions, 1 (4%). These results are comparable to the earlier ASRS study of altitude deviations (ref. 4). An evasive action, conflict alert, potential conflict, or less than standard separation was reported in 19 (76%) of the AD occurrences.

Human error is clearly evident in the ADs. Over half (13) involve pilot perception as the enabling factor, and 10 involve pilot technique. A factor in an occurrence is classified as "enabling" if its absence probably would have precluded the occurrence.

The data show that the mind-set phenomenon is the dominant predisposing condition for the human errors leading to ADs; and almost half of the ADs, 12 (48%), were classified in the mind set assigned to another aircraft (MSA) category; 2 (8%) in the mind set flight planned (MSF) category; 2 (8%) in the mind set requested (MSR) category; and one was coded in the MSH category. The phenomenon is illustrated in these narratives:

> Pilot of small aircraft was assigned 3,000 ft after departure from Ft. Lauderdale Executive Airport. Pilot was observed climbing through 4,600 ft at which time I questioned his assigned altitude. Pilot had filed for 8,000 and was climbing to that altitude. No other traffic involved.

* * *

> Aircraft A that departed Chattanooga Airport was given vectors to on course and was told to maintain 5,000 ft. Aircraft A requested 7,000 st due to other aircraft going in the same direction. Later on, Aircraft A was given instructions to climb to 6,000 and he advised that he was at 7,000 ft.

The data do not support the belief that many altitude deviations occur in the high-density terminal areas, inasmuch as only 4 (16%) of the occurrences were in airport traffic area (ATA) or terminal radar service area (TRS) airspace. However, liberal coding of other controlled airspace (OCA) airspace for mission phases typical of terminal areas may explain this result.

Altitude deviations, therefore, account for a significant portion of SPIFR operational problems, with overshoots being reported several times more often than are the other types. Human error and workload appear to be the main factors leading to ADs. Increased emphasis on the importance of pilot actions such as altitude readback and verification of altitude when in doubt seem to have the greatest potential for reducing the incidence of ADs. In a period when the use of altitude encoding transponders is increasing, it is surprising that ADs rank so high on the list of SPIFR operational problems. A pilot leaving an assigned altitude is required to report to ATC. A benefit of mandatory reporting of arrival at a newly assigned altitude (thereby placing that altitude at a higher level in the pilot's consciousness) could be weighed against the costs of increased frequency congestion if ADs are judged to be a severe safety problem.

Improperly flown approach– Improperly flown approach occurrences are the third most common category of SPIFR operational problems identified in the study data set, accounting for 15% of the combined SMA and SMT document sets. Reports of improperly flown approaches have been submitted by pilots and controllers, although more often by the latter (12 of 18 occurrences, or 67%).

The instrument approach phase of a SPIFR flight generally subjects the pilot to greatest workload and often tests instrument flying skill to the limit. Accident data continue to demonstrate the high percentage of aviation accidents which occur in the landing phase, including the instrument approach. A study of NTSB accident files for the period of 1964 through 1975 revealed 877 single pilot, pilot-error accidents, 446 (51%) of which occurred during the landing phase; 335 of the 446 had filed an IFR flight plan. Detailed examination of the 335 reports revealed that 96 (29%) occurred during an ILS approach, 90 (27%) during a VOR approach, 30 (9%) during a LOC approach, and 21 (6%) during an NDB approach (ref. 5).

Of the 18 improperly flown approach occurrences described in this study's data set, 9 (50%) occurred during an ILS approach, 4 (22%) during a VOR approach, 2 (11%) during a LOC BC approach, and 2 (11%) during an NDB approach. Radar assistance was available in 67% of the occurrences, and it is likely that it was also available in an additional 16%. An evasive action, conflict alert, potential conflict, or less than standard separation was reported in 7 (39%) of the occurrences. Three of the five pilots who reported flight time had a relatively high amount of flight experience. The role of ATC in assisting pilots having difficulty in flying an instrument approach is clear, with ATC being credited as the recovery factor in all but one of the nine occurrences in which the factor was identified.

The operational problem experienced by the pilot in each of the six occurrences reported by pilots is summarized below. Lack of IFR single pilot proficiency may be inferred in each of the occurrences.

1. Cleared for an ILS approach, pilot reports following GS but never intercepting LOC, and overflying airport.

2. After an IFR proficiency flight, pilot reports that his CFII executed a missed VOR approach incorrectly.

3. Pilot reports having incorrectly tracked his LOC on a BC approach due to fatigue, resulting in a missed approach.

4. Pilot reports experiencing vertigo during night ILS approach, resulting in missed approach.

5. After being radar-vectored to the VOR/DME final approach course, pilot reports incorrectly turning outbound to fly a procedure turn.

6. After missing first attempt at an NDB approach, pilot reports landing out of an approach when not in a normal position to do so.

Twelve improperly flown instrument approaches were reported by air traffic controllers. Each revealed a severe lack of IFR single pilot proficiency. The performance of the pilot, as reported by the controller in each occurrence, is summarized as follows:

1. SMA was vectored for a VOR approach five times. Nonradar approach was then issued.

2. SMA did not report a missed ILS approach in a timely manner, and did not comply with published missed approach procedure. Disruption resulted in coordinating three other aircraft operations.

3. SMT tuned in wrong NDB in order to fly an NDB approach.

4. Inbound on an ILS approach, SMA made a 180° turn at the OM.

5. Radar-vectored for third attempt at an ILS approach; upon intercepting final approach course, SMA reversed course and flew outbound.

6. After being cleared for a nonradar ILS approach, it was determined that the SMA pilot did not know his position and had descended below the minimum IFR altitude.

7. SMA did not report a missed ILS approach in a timely manner and overflew the airport.

8. SMT did not perform contact approach properly and missed the airport.

9. SMA made two 360° turns on the final approach course of an ILS approach during simultaneous parallel ILS approach operations.

10. SMT landed out of an ILS approach on the wrong parallel runway over a wide body transport holding in position for takeoff.

11. SMA missed two LOC(BC) approaches and one ILS approach. Radar vectors were then given to the airport.

12. Cleared for a VOR approach, SMA incorrectly initiated a 180° course reversal to perform a procedure turn.

Pilot lack of awareness of position during an instrument approach was a factor in at least three of the improperly flown approach occurrences (003, 056, 113), as illustrated by the following narrative:

> . . . Vectors were issued to VOR A approach circle to land runway 32. During the next 25 min the aircraft was within 12 miles of the airport but did not land until 1210 EDT. Five different times Aircraft A was vectored to intercept the Deer Park 066° radial for the approach and all five times he couldn't find it. Finally, radar service was terminated and he was issued a nonradar clearance for the VOR approach. This all took 15 min and was within 6 miles of VOR. After Aircraft A reported Deer Park on the approach, it took him another 10 min to go 6 miles on final and land. The pilot seemed to know nothing about instrument flight . . . (003)

The seriousness of the possible consequences of improperly flown approaches can be appreciated through a reading of the following narratives:

Small Aircraft A was vectored to runway 27L simultaneous approach to Chicago O'Hare with a restriction to hold short of runway 32L on landing roll out. I was monitoring the 27L final and noticed a drift off the localizer to the right. I made a transmission on the local control position override to have A stop descent, and to turn left immediately. No immediate response was received from A. The aircraft made two 360° turns on the final. Aircraft B on the right final had to be given an emergency descent. Wide body transport C was pulled off the 27R final to avoid traffic, and small transport D on the left was also pulled off and descended. This pilot is obviously unaware of the approach procedures and the area including the airport since he subsequently got lost on the ground.

* * *

Small Aircraft A executed two erratic back-course approaches to runway 11, missing both. A then executed ILS runway 29 approach, during which pilot stated "I lost it." A period of intermittent communications followed. A rescue crew was dispatched. A established contact with St. Louis Approach Control and declared critical fuel. Approach Control vectored the aircraft to the airport. A landed runway 11 without reported damage or injury. Upon servicing the aircraft, the FBO advised Alton tower that A took on 36 gallons (38 gallon capacity). Alton weather was: SP XX09 local -X M3 OVC 3/4 F 0912. SA XX49 local -X M4 OVC 1F 0915/997.

There is evidence that some pilots do not understand when NOT to execute a procedure turn maneuver as part of a published instrument approach procedure. A procedure turn is not to be performed if one of the following conditions is present: (1) the instrument approach procedure chart indicates "NoPT" (no procedure turn), or "procedure turn NA" (not authorized), or (2) the approach clearance issued reads "radar vectors to final approach course," or "cleared for a straight in approach," or (3) when the approach can be made from a properly aligned holding pattern. A recent issue of the DOT/FAA Airman's Information Manual – Basic Flight Information, and ATC Procedures Manual, reveals a certain lack of information on this subject under the index heading "Procedure Turn" (ref. 6). The FARs contain little about the matter (ref. 7). The following excerpt from a report narrative illustrates that some IFR single pilots think that they must fly a procedure turn.

Approach Control cleared me for a VOR/DME approach to runway 20L at Nashville. I apparently was being vectored to intercept the 204° radial to track inbound when Approach directed me to contact the tower. I immediately did so, initiated a turn outbound on a heading of 024° and advised the tower of my turn to the right and that I was heading outbound. The tower did not acknowledge. Approximately 30–40 sec later as I was steady on the 024° radial outbound, the tower inquired "Where are you going?" I advised that I was headed outbound for a procedure turn. Tower instructed me to stand by. I interpreted this to mean continue on present heading and altitude. The tower also instructed me to contact approach control. Approach vectored me back in to intercept the 204° radial and to track inbound. I was also admonished that procedure turns are used only upon instruction or acceptance by the controlling facility . . . .

In summary, there are IFR single pilots who are having difficulty flying instrument approach procedures properly. The consequences can be serious. There appears to be a variety of reasons for the performances described during this crucial phase of an instrument flight. Lack of skill in flying and knowledge of how to fly the instrument approach procedure probably contribute most to the incidence of these occurrences. Lack of skill results from lack of proficiency or lack of thorough instrument flight training. Lack of knowledge may be a result of inadequate trainging or the absence of recent familiarization with the important aeronautical information required of a competent instrument pilot. As to unnecessary procedure turns,

a more thorough treatment of the subject in the AIM and on the instrument rating written examination would have the potential for reducing the frequency of these occurrences.

Heading deviation– Heading deviation occurrences are the fourth most frequent category of SPIFR operational problems identified in ASRS-2, accounting for 13% of the combined document set. There were one-and-a-half times as many altitude deviation occurrences by SMA as by SMT, and three times as many heading deviations. Reports of heading deviations have been submitted by pilots and controllers, although overwhelmingly by the latter (15 of 16 occurrences, or 94%).

Where it appeared through a close reading of the narrative that the mind-set contributing factor could explain why the heading deviation occurred, it was coded.

Like altitude deviation occurrences, it is likely that some heading deviations occur because of misunderstood clearances. Again, given the read-back redundancy available to compensate for misunderstandings, heading deviations, like altitude deviations, are particularly disturbing. The following is a clear example of a misunderstood heading clearance:

> Aircraft A departed heading 255° climbing to 4,000 ft MSL. Aircraft B departed heading 210° climbing to 4,000 ft MSL. Aircraft A accepted an instruction issued to a third aircraft and turned left into aircraft B . . . .

Unlike altitude deviation occurrences, the mind-set phenomenon did not emerge as a possible reason for heading deviations. However, workload is clearly a factor, with 69% (11 of 16) heading deviation occurrences taking place during the departure phase of an IFR flight, versus only 28% of the altitude deviations. Another 3 (19%) happened during APR and MAP phases. Only 2 were in the ENR phase. The data do support the belief that heading deviations occur in the high-workload terminal areas, with 11 (69%) coded in airport traffic area (ATA), terminal radar service area (TRS), and terminal control area (TCA) airspace.

Of the 16 SPIFR aircraft involved in heading deviation occurrences, 12 involved SMA aircraft and 4 SMT aircraft. Heading excursions accounted for the greatest number of deviations, 7 (44%); followed by heading reversal and heading maintained with 3 (19%) each; and heading overshoot, heading deviation, and intentional heading change with only 1 (6%) each. An evasive action, conflict alert, potential conflict, or less than standard separation was reported in 14 (88%) of the occurrences.

Human error appears in heading deviation occurrences, with 6 (38%) involving pilot perception as an enabling factor, and 3 involving pilot technique.

The following excerpt illustrates that sometimes pilots turn right when they have been asked to turn left:

> . . . Aircraft A was assigned 320° then 150° then left to 020° for vector around Aircraft B. Aircraft A turned right, which took him into the path of Aircraft B on final resulting in 300 ft and maybe 1-1/2 miles separation . . . .

Three of the occurrences (19%) involved IFR training operations, suggesting that instrument flight instructors may be permitting their students to proceed too far into a heading deviation before correcting them, to the extent that a potential conflict or less than standard separation occurs, requiring evasive action:

> . . . I believe this situation occurred because of bad flight instructor technique in allowing the student to deviate from ATC instructions. This seems to be a more common occurrence all the time. In my opinion the flight instructors are letting their students go too far to see if

they can discover and recover from errors they have made in navigating or following ATC instructions. Flight instructors are still responsible for the flight and to make certain that ATC instructions and FARs are complied with. I feel the quality of IFR training is certainly in question in many accidents.

In summary, the heading deviation occurrence is one of the more frequently reported SPIFR operational problems, with heading excursions being reported most often. Human error and workload are identifiable factors in heading deviation occurrences. Efforts to emphasize the importance of heading readback and verification of heading, when in doubt, have the potential for reduced occurrences of heading deviation. The instrument flight instructor practice of letting students experience the consequences of their errors could be examined with a focus on their effect on the ATC system, with advice disseminated to the instructor population.

Position deviation– A position deviation occurs when either a controller or the pilot reports that an aircraft has been determined to be somewhere other than where the ATC expected it to be. Position deviation occurrences represent 7% of the SPIFR document set. There were 7 SMA occurrences (2 reported by pilot and 5 by controller) and 2 SMT occurrences (1 each reported by pilot and controller).

All but one of the occurrences happened during the en route phase of flight, an anticipated characteristic of position deviations. In all but two pilot-reported occurrences, the enabling aircraft had not been acquired on radar before the position deviation took place. More often than not, the pilot either was not aware of the position deviation, or knowing it, did not advise the ATC. The operational mission (operation) was not likely to be flown by a professional pilot.

Although the pilot appears to be the cause of most position deviations, ATC can contribute to the occurrence by issuing a nonradar, no-direct-communications clearance to a NAVAID out of service because of maintenance:

> . . . Aircraft A was given a clearance from Jacksonville Center from Swainsboro, Georgia, Emanuel Co. Airport to Dummy intersection, which is made up by the Dublin 210° radial and the Vienna 138° radial, 21 DME. Dublin VORTAC was out for maintenance. Nonradar at 6,000 ft was approved from Swainsboro to Dummy. This flight path crossed approximately 40 miles southeast of Macon at the closest point, just cutting Macon Approach Control Airspace southeast of Dublin VOR. Aircraft A was radar identified approximately 15-20 miles east southeast of Macon out of 2,900 ft climbing to 6,000 ft. Aircraft B had just gone through the area at 2,000 ft in the radar pattern at Robins AFB. No direct radio contact had been established with Aircraft A to this point. All clearances and pilot position reports were relayed by MDA 200 to Jacksonville Center. Aircraft A was on a west northwest course when he should have been southwest bound and he was approximately 25 miles north of course.

The importance of a clearance confirmation in preventing a position deviation is illustrated by the following occurrence:

> Pilot had filed for an IFR clearance from Oklahoma City Expressway Airpark to Oklahoma City VORTAC, then V14 to Hobart and Childress VORTACS. Clearance received was Oklahoma City VORTAC to V272, to intercept the 360° radial of Hobart VORTAC then direct to Hobart VORTAC then to Childress VORTAC and on to Midland, Texas, via original IFR flight plan requested. After departure and after passing Oklahoma City VORTAC on the V272 airway, the pilot was notified to "resume own navigation," correction, "assume original

flight plan." Pilot assumed his request for V14 from Oklahoma City to Hobart to Childress legs were now approved . . . .

As shown in the next example, the position deviations can sometimes be large. Of course, the controller may have heard "Evansville" when the pilot actually said "Louisville."

Aircraft A called VFR at 6,500 ft and gave his position as approximately 20 DME west of Evansville tracking inbound to Evansville on the 225° radial and requested IFR to Charlotte at 9,000 ft. After appropriate coordination with Evansville Approach Control who owns 8,000 ft in the area, I cleared Aircraft A direct to Evansville V4 Louisville flight plan and told him to report Evansville, as he was below radar coverage in the area. Standiford Approach Control (the next facility the flight would enter) called and asked where the flight was as they had acquired a track on it over the Louisville VOR (approximately 105 DME east of Evansville VOR) . . . .

Pilots who do not maintain airways as cleared can cause potential conflicts requiring evasive action:

. . . At this time I told Aircraft A that he was in radar contact 1-1/2 miles northwest of Lafayette VOR, 12–13 miles east of V128 – as he was cleared (which I confirmed with the pilot). Commuter Aircraft B was departing Lafayette Airport northbound, over Lafayette VOR climbing to 6,000. B was stopped at 4,000 ft in time, but would not have been if I had not seen A when I did. This situation occurred because the pilot could not navigate V128 or was cutting the corner.

If ATC tells a pilot he is somewhere other than where he thinks he is, he might not agree:

I frequently fly to MHT Airport (Manchester, NH) via Boston VOR 343° radial to Pelan intersection, direct MHT. Consistently Boston Approach Control tells me I'm 6 miles south of Pelan intersection when my own navigation tells me I'm at Pelan. Pelan is formed by the Boston 343° radial and MHT Localizer. I suspect the MHT LOC has a kink that sends it more southeast than it should. Since the angle between 343° and 352° is so small, a small kink could result in a substantial error in Pelan's location. It's a small thing, but I thought I'd mention it. Incidentally, my navigation receivers are properly aligned, so I don't think the problem is in my radios.

One position deviation occurrence was reported by both the controller and the pilot. The controller's analysis suggests that the pilot reported over an NDB (7.2 n. mi. from runway threshold) when inbound on an ILS approach when he was instead over the OM FAF (3.8 n. mi. from runway threshold). The pilot's narrative is somewhat confusing and irrelevant in content suggesting that the FAF was an LOM, when in fact the NDB was not collocated with the OM in this approach:

. . . Tower controller was trained by FAA to believe that pilots always (must) report passing Final Approach Fix (LOM) and predicated separation for departing IFR small transport Airplane B on this mis-training. Near miss occurred. The problem is that a pilot report over the final approach fix (FAF) is only recommended practice. However, FAA has led people to believe that a report over the FAF (maltese cross) is required, therefore expected by controllers when providing separation, creating an insidious potential hazard for a midair collision.

Experienced instrument flight instructors have noted that one important characteristic of skilled instrument pilots is their "positional awareness," – knowing at all times and without doubt where they are, where

they are going, and how they will get there. This concept of how to operate more safely and efficiently as an instrument pilot is rarely explicitly presented in instrument flight training programs. Pilots who understand and can consistently apply the concept of positional awareness are not likely to experience position deviations, or heading and altitude deviations. It would appear that instrument flight training programs, both initial and refresher, could place increased emphasis on the concept, with the result that IFR single pilots might indeed operate more safely and efficiently. It is suggested that most IFR single pilots operate in a first-order mode of heading, altitude, and present position. Positional awareness, however, is a higher order mode of operation, consisting of an accurate mental picture of one's present and future location in three-dimensional space, and an ability to work with time, speed, distance, and rates of change of heading, altitude, and position.

In summary, some IFR single pilots are not where ATC thinks they are, whether or not the pilots know where they are themselves. Emphasis on positional awareness during instrument flight training could produce safer, more efficient IFR single pilots.

Below minimums operation– Seven below minimums operation occurrences were identified in the SPIFR document set, 6 involving SMA and 1 involving SMT. A below minimums operation is one in which the actual weather is lower than the minimums prescribed for the particular operation, and a pilot performs a takeoff (2 occurrences), or lands an airplane (4 occurrences), or must divert to an alternate (1 occurrence).

All three of the below minimums occurrences reported by pilots were air taxi flights flown by relatively experienced pilots. Cognition encompasses the behaviors by which people become aware of, and obtain knowledge about, their relationship to their environments (ref. 8). In both of the takeoff occurrences, the pilot's cognitive process was involved:

> I departed runway 12R thinking that I had my departure minimum of 1,800 ft RVR. Ground control gave me the RVR as 1,400 but I failed to read back and my misunderstanding was not detected.

* * *

> . . . I read the takeoff minimums listed on page XII of the U. S. Government Instrument Approach Procedures – U. S. South Central Volume 1 of 2 (NOAA) prior to takeoff and noted them as being 1/2 mile. Although I took off on runway 22, I did not realize until later in the day, that the published minimums only applied to runway 4 and not to runway 22 . . . .

A decision is the formulation of a course of action (from a limited number of alternatives) with the intent of executing it (ref. 8). A pilot's decisionmaking process resulted in landing an air taxi flight out of an instrument approach when the weather was reported as indefinite ceiling 300 sky obscured, 1/8-mile surface visibility:

> . . . During the approach I experienced constant missing in both engines. Upon reaching the Outer Marker I could clearly see a portion of the approach light system due to breaks in the obscuration. I continued with the approach, momentarily losing sight of the approach lights but regaining sight once again 100 ft above the decision height. Rather than head to another airport and have the engines possibly quit somewhere en route, I decided to continue the approach since I clearly had the approach lights in sight and could, at 100 ft above decision height, see the runway 5 threshold.

The importance of proper preflight planning in making the important weather go/no-go decision also involves the pilot's decisionmaking process, and could prevent "getting into a situation he was very fortunate to survive":

> At 2:36 PM a small aircraft declared a missed approach at Akron-Washington Co. Airport, Colorado, to Akron Radio. He advised that he was encountering moderate icing conditions, and was unable to climb above 5,600 ft MSL (1,000 ft above the terrain). Akron Radio relayed this information to Denver ARTCC Sector 15 and said that the weather had just gone to indefinite ceiling zero, sky obscured, visibility zero in fog (a fast-moving winter storm was moving through the area). Sector 15 advised Akron FSS to switch aircraft to sector 15 frequency. Aircraft reported on frequency and advised that he was unable to climb, had lost his gyro vacuum system and airspeed indicator and needed help. A check of alternates showed that Denver was the only field that had approach minimums. An emergency was declared by Denver ARTCC and the aircraft was vectored to Buckley ANG Base and landed safely at 3:31 PM. (Quite a bit transpired between Akron and Buckley. No airspeed indicator, maximum altitude was 6,000 ft MSL, fuel gauges on empty last 15 min.) Cause: Pilot allowed *himself to get into a situation he was very fortunate to survive.* Low on fuel, moderate icing, nearest alternate almost out of range, minimum IFR equipment installed. Pilot failed to realize the severity of the fast-approaching cold front.

Landing out of an approach when the weather is reported to be below published minimums can have unfortunate results:

> Small Aircraft A departed Roanoke for Bluefield. As controller, I was working the nonradar sector for Roanoke Approach. This is beyond the radar coverage for Roanoke. The aircraft came on my frequency and at that time the Bluefield weather was below ILS runway 23 minimums. En route the weather decreased to ceiling zero, visibility 1/4 mile and fog. He missed on first approach. Later he was cleared for second approach and turned over to Bluefield Radio for Advisory Service, and to report his down time or missed approach to them, as he would be out of Roanoke Approach radio coverage. Later that night, I was advised the aircraft had landed, collapsed the gear, and was in a snow bank, and the runway was closed. Four persons were on board with no injuries, and the aircraft suffered minor damage.

In summary, there are SPIFR flights being conducted below minimums. The number of occurrences is too small to detect any pattern. However, better preflight weather planning coupled with more conservative go/no-go decisionmaking, and more acute cognitive processes would lessen the incidence of these occurrences.

Loss of airplane control– Loss of airplane control during flight in IMC can have dire consequences. This SPIFR operational problem is a small but identifiable part of the document set. Loss of control occurs when a pilot reports to be no longer in control of the airplane attitude. Except for an apparent wake turbulence encounter, it is surprising that pilots with the total flight time in these four occurrences would experience the loss of airplane control reported.

The mere distraction of tuning VOR receivers has resulted in a loss of airplane control:

> . . . After entering the clouds and level at 5,000 ft on an easterly heading which Departure Control had given me, my No. 1 VOR indicated that the course was west of me. My No. 2 VOR had the OFF flag showing. While retuning the VORs, I inadvertently rolled into a right bank and turned to a heading of 180°. I then rolled into a left turn at which time Departure

Control requested my intentions. I said that I was trying to intercept the airway. Both VORs now indicated that I was well east of course. Departure Control then gave me a right turn direct to New Hope. Having already started a left turn, I requested and received a left turn direct to New Hope. I then proceeded direct with no further distractions. I momentarily forgot rule No. 1, fly the airplane.

An apparent wake turbulence encounter provided an instrument flight instructor and his student with a brief, violent ride:

Takeoff from runway 24 complex, Los Angeles Ventura departure. Entered overcast at about 1,000 MSL, gauges frozen, everything looking good, IAS 120. IAS went quickly to 186, VSI pegged down direction. . . . I adjusted more and more nose up on the artificial horizon. It didn't make much difference on IAS or VSI. (Heading still OK at 255.) Suddenly the IAS went up to 190 and decreasing fast – VSI pegged up, I adjusted for more nose down than I normally like and got IAS stabilized at 90–100. Nose started drifting left, I applied more right rudder and aileron. Controller said turn right to 270°. Aircraft kept yawing left, me trying to get to 270, got it stopped at 230. Aircraft suddenly stabilized and I came around to 280, OK. Scared the hell out of me. I related my situation to the controller. He stated a jumbo had passed abeam of my track at about 4,000 ft a few minutes ago. He gave me a telephone number to call when I arrived at Paso Robles so we could analyze the situation. Controller told me over the telephone they had checked everything out and thought the problem may have been a medium large transport which took off about 6 min in front of me. I think the problem was the jumbo flying abeam of my track because of the initial pitch-up then pitch-down attitude or maybe a combination of the jumbo and the medium large transport. I have done a lot of soul searching on this matter – spatial disorientation – I don't think so. At present wake turbulence seems to be a black art, and really little one can do about it when flying IFR, complying with clearances, procedures, etc., in the real world.

An equipment malfunction, combined with a passenger distraction, can result in abrupt loss of airplane control:

I was 27 miles northeast of the International Airport at the Twin Cities at 4,000 ft when I lost autopilot and dropped 1,800 ft. I also believed I heard that I was to start the approach and was turning. I had a baby in the seat behind me and she was screaming at the top of her voice. I started to turn and I suddenly lost the autopilot and dropped 1,800 ft. Then approach radar picked me up. I climbed up to 4,000 ft on a vector. They called me. I explained what happened and as I did not cause any interference with other aircraft and recovered adequately, they said "no write up."

Continuing an IFR flight into an area of turbulence after a vacuum pump failure had serious consequences:

IFR on top of broken layer and VFR conditions below. After departure I lost vacuum pump. Continued on top, with VFR conditions below. Entered tops without gyros and flew on needle, ball, and airspeed. Entered turbulence and lost 3,000 ft, then climbed 2,000 ft and unable to follow instruments due to turbulence. I had informed each controller that I had no gyros and was on top for 1 hr. In rain and turbulence and rolled over and also exceeded red line airspeed by 40 mph. Finally made ground contact (visual) and saw I was inverted. Rolled out straight and level at red line plus 30 mph and requested a no-gyro approach in haze with 3-5 miles visibility. Landed at XYZ – where aircraft is to be inspected for damage.

To summarize, loss of airplane control, although a small but identifiable part of the SPIFR operational problem document set, can have serious consequences. The importance of basic airplane attitude control while the pilot is dealing with a distraction is evident in these reports. The FAA has been concerned about the ability of pilots to handle distractions, and in January 1980 announced a policy of incorporating the use of certain distractions into the performance of all flight test maneuvers. In an advisory circular, the FAA noted that at the time of their next revision, all flight test guides would be changed to include distractions appropriate to selected flight maneuvers listed under pilot operations (ref. 9). During the interim, FAA inspectors and designated pilot examiners may incorporate the use of realistic distractions during the performance of flight test maneuvers. Although the FAA's concern was a result of findings in a stall awareness study (ref. 10), on the basis of these occurrences, the concept is also appropriate for instrument flight tests.

Mandatory report omitted– Four occurrences in which the IFR single pilot forgot to make a mandatory report were identified in the SPIFR Document Set: two were SMA occurrences, two were SMT occurrences. One was reported by the pilot, three were reported by controllers.

The Airman's Information Manual, published by the DOT/FAA, and FAR 91.125 specify what reports should be made to ATC or FSS facilities without request. If pilots fail to do so, they have forgotten to make a mandatory report without request. In addition to these reports, a pilot is expected to report on a newly assigned frequency. This category of SPIFR operational problem has too few occurrences to permit meaningful analysis. However, a close reading of the narratives indicates that each failure to make a mandatory report involved more than the pilot's simply forgetting.

A flight instructor, for example, permitted his ATP student to land out of an approach without a landing clearance:

> . . . While instructing an ATP candidate in multiple approaches to runways 8L and 4R at Honolulu, I allowed the aircraft to be landed without calling Outer Marker inbound to Tower and monitoring Tower frequency. The factors that played a part in this event were: use of headset and boom microphone by the student and yoke-mounted push to talk switch reduces the instructor awareness that a transmission had been made. On all previous approaches for the last three nights, the controller advised OM and change of frequency, lulling the student into the mode of dependence on the call to report OM.

Interfacility coordination problems also seem to contribute to a pilot's tendency to omit making a mandatory report. For example, ATC terminates radar service on an IFR flight and makes a nonradar handoff; the pilot then forgets to make a report over a designated, compulsory reporting point but requests an altimeter setting; the new ATC facility fails to recognize that the requesting aircraft is IFR; and the flight then proceeds through controlled airspace without being controlled or separated.

If a pilot fails to report on a newly assigned frequency and ATC facilities fail to make a coordinated attempt to recontact the aircraft, flight safety can be compromised, as illustrated by the following synopsis:

> Center controller told pilot of corporate twin to change to Approach Control. Pilot acknowledged. Controller later became concerned when the aircraft came close to another aircraft which he had also handed off to Approach. He then learned that the twin was still on his frequency. Pilot said he thought he had changed. Controller alleges a feud between Approach Control and the Center, and that Approach deliberately waited for the incident to occur before taking action.

One report illustrated that departing aircraft operations can be adversely affected when an aircraft on an instrument approach is not handed off, and the pilot forgets to report to the tower inbound on final approach.

Fuel problem– Averaging once a day, a general aviation airplane experiences either fuel exhaustion or fuel starvation (ref. 11). Apparently the SPIFR operation is not immune from the threat; two fuel problems were identified.

In the first occurrence, a pilot experienced the effects of water contamination in the fuel. He declared an emergency to obtain an immediate approach clearance.

In the second occurrence, an air taxi pilot unnecessarily declared an emergency and diverted to another airport because he perceived that he had inadequate fuel to proceed to his destination. He checked the fuel during a preflight inspection by observing fuel gauges which read full. After takeoff, the fuel gauges dropped toward empty. Subsequent inspection revealed that he did have sufficient fuel.

In both cases, a more thorough preflight inspection would have prevented the occurrence. The experience level of both pilots suggests adequate experience in preflight planning.

Improper holding– Holding is an aspect of aeronautical knowledge that is particularly difficult for the SPIFR to grasp and apply reliably. Surprisingly, only two improper holding pattern occurrences were identified in the study data set, both by SMT.

An ATC interfacility coordination problem combined with the pilots' uncertainty of their clearances resulted in two aircraft passing with less than standard separation, after ATC issued an evasive action turn to one of them.

A pilot holding improperly can stray into adjoining airspace, becoming a hazard to other aircraft with less than standard separation.

A pilot's clear understanding of an ATC holding clearance, combined with the knowledge of how to fly a holding pattern properly, would reduce the chances of similar occurrences.

Safety, Efficiency, and Workload Characteristics of the Operation

The safety, efficiency, and workload characteristics of the SPIFR document set occurrences were analyzed to assess the seriousness and significance of the operational problems reported.

The analytical schemes are arbitrary and to some extent subjective. However, these schemes are considered reasonable given the nature of the data and the ASRS objective to provide insights into the existing problems.

Safety– Safety is freedom from the risk of injury or loss. A useful analytical scheme must have the ability to discriminate the degree of risk present in a given occurrence. The general scheme for analyzing the safety characteristics of the SPIFR occurrences consists of ascertaining which of the following terms best describes the degree of risk present in each occurrence:

> INCIDENT (HIGH RISK): an act or condition likely to lead to grave consequences (e.g., midair collision, crash during an instrument approach, or an occurrence for which an ASRS Alert Bulletin has been issued).

ERROR (MEDIUM RISK): an act or condition of ignorant or imprudent deviation from a code of behavior (e.g., altitude deviation or improper holding pattern procedure where no threat to another aircraft occurred). Incident and error were considered to be mutually exclusive.

ANNOYANCE (LOW RISK): a source of irritation causing displeasure, as reported by the pilot of the enabling aircraft.

These terms were further defined for each operational problem category, as appropriate.

Efficiency– The impact of SPIFR operational problems on the efficient conduct of instrument flight was assessed on the basis of the operational result of the occurrence. An efficient instrument flight is one which functions in the best possible and the least wasteful manner.

Efficiency was judged to be a characteristic in each SPIFR occurrence (1) for single aircraft occurrences if the pilots perceived they were receiving inadequate service, and it was judged that their expectations were reasonable, and (2) for multiple aircraft occurrences if an aircraft other than the enabling one was requested by ATC to change heading or altitude, or to hold.

Workload– Workload is the amount of work that the SPIFR is required to perform. The report content in the ASRS database does not lend itself to the application of traditional human performance measures of workload. The cognitive, perceptual, and motor behavioral processes present in the single piloting of an aircraft IFR cannot be extracted from the ASRS data with any acceptable degree of accuracy. Indeed, these processes are only usefully observable in a laboratory setting under carefully controlled and instrumented experimental conditions.

As an approximation of the influence of workload in the reported occurrences, the researcher made an ad hoc decision based on its influence on the phases of an IFR flight which are generally regarded as high workload situations for a SPIFR. If the mission phase was a departure, arrival, approach, missed approach, or hold, then workload was deemed to have been a factor in the occurrence. Also, if a report narrative mentioned workload as a factor, the occurrence was counted as having a workload characteristic. All below-minimums-operation occurrences were assumed to be workload-related.

The presence of workload as a factor can also be inferred if a pilot's perception about the real world is different from reality, and his performance based upon that perception results in an occurrence. A pilot must have both the time and the opportunity to correctly assess a real-world situation and act upon it. Workload is cited as one important cause of a pilot's perception not matching reality; it appeared that this was the case in 28% of the reports in this study data set. Therefore, all reports in the data set that were tabulated under workload contained pilot perception as an enabling factor.

In terms of safety, 52% of the SPIFR document set occurrences involved an incident, 35% involved an error, and 36% an annoyance. The efficiency of IFR flight was adversely affected in 37% of the occurrences. Applying the mission phase determinant of workload as a factor resulted in 73% of the SPIFR occurrences being categorized as workload-related. Applying the pilot perception enabling factor as a determinant resulted in 28% of the occurrences being categorized as workload related.

CONCLUSIONS

1. Ten SPIFR operational problem categories have been identified in the ASRS-2 database. In order of decreasing frequency of occurrence, they are: pilot allegations of inadequate service (30%), altitude deviation (20%), improperly flown approach (15%), heading deviation (13%), position deviation (7%), below minimums operations (6%), loss of airplane control (3%), forgot mandatory report (3%), fuel problem (2%), and improper holding (2%).

2. It appears that the operational problems being experienced by the SPIFR may be independent of experience. Although this hypothesis needs to be tested more thoroughly, it is suggested that if the hypothesis were found to be valid, then remedies to SPIFR operational problems do not lie in improving SPIFR capabilities through more training and experience. Rather, the nature of the SPIFR task should be changed through the redesign of cockpit systems and ATC procedures in handling the SPIFR.

3. Safety, efficiency, and workload factors are present in SPIFR operational problem occurrences. Half of the occurrences involved an act or condition likely to lead to grave consequences, and one-third involved an act or condition of ignorant or imprudent deviation from acceptable procedures. In more than one-third of the occurrences, the efficiency of IFR flight was affected. Depending upon what determinant is used to assess workload, between one-quarter and three-quarters of the occurrences involved workload as a causal factor.

4. The most frequently identified SPIFR operational problem was a pilot's allegation of inadequate service. Three-quarters of such allegations were deemed reasonable.

5. A pilot's "mind set" was a factor in altitude deviations, appearing in 68% of the occurrences.

6. Lack of pilot proficiency is apparent in improperly flown approach occurrences. In 22% of these occurrences, there was evidence that pilots did not understand when *not* to execute a procedure turn.

7. Pilot lack of awareness of position is an important factor in position deviation occurrences.

8. Takeoff below minimums occurrences were related to the pilot's cognitive processes. Landing below minimums occurrences probably could have been prevented by better preflight weather planning and more conservative decisionmaking by the pilot.

9. Pilot distraction led to loss of airplane control. Even relatively experienced pilots lost airplane control.

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4. NASA Aviation Safety Reporting System, Third Quarterly Report, Oct. 15, 1976 to Jan. 14, 1977. NASA TM X-3546, 1977.

5. Single Pilot IFR Operating Problems Determined from Accident Analysis, NASA TM 78773, 1978.

6. Airman's Information Manual Basic Flight Information and ATC Procedures, DOT/FAA, 1981.

7. Federal Aviation Regulations, Part 91.116(h) Limitations on Procedure Turns.

8. A Method for the Study of Human Factors in Aircraft Operations, NASA TM X-62472, 1975.

9. FAA Advisory Circular 61-92, Use of Distractions During Pilot Certification Flight Tests, January 25, 1980.

10. General Aviation Pilot Stall Awareness Study, Report No. FAA-RD-77-26, 1977.

11. "Time in Your Tanks," presentation prepared for FAA Accident Prevention Program by the General Aviation Manufacturers Association, October 1976.

ALERT BULLETINS

INTRODUCTION

As usual in these reports, a selection of Alert Bulletins is included, with the responses offered to them by the appropriate addressees – normally the FAA, airport managers, and the USAF. ABs dealing with charting matters, addressed to NOAA, seldom bring written responses, but action is often confirmed by subsequent information. ABs are classified under several general topic headings; as might be expected, the majority deal with reported problems involving ATC facilities and procedures. It should be noted that Alert Bulletins are based on the narratives submitted by individual reporters, with their recommendations. ASRS does not investigate the reported situations independently.

NAVIGATION

1. Text of AB: Allentown, PA, SNOWY intersection: A pilot reports that, cleared to SNOWY intersection en route to Allentown via V-93, he mistakenly interpreted the clearance limit as SHOME, an intersection on V-93 17 miles southwest of SNOWY. Reporter infers that many pilots unfamiliar with the area would tend to pronouce each syllable of the intersection name as printed on navigation charts, and believes that "SHOME" and "SNOWY," as heard on aircraft radio, can sound very similar. To eliminate potential hazard, reporter recommends that one of the two intersections be renamed, eliminating the possibility of confusion in locating an important holding fix for Allentown.

Text of FAA Response: Name of "SHOME" changed to "DUMMR."

* * *

2. Text of AB: An instrument flight instructor reports that similar sounding names of two navigational fixes, WRAPS intersection and RAMPS nondirectional beacon – both used in conjunction with approach procedures at MOD – caused confusion during a recent flight into the area. The reporter believes the phonetically similar names create an unnecessary potential for human error and recommends a name change for one of the two fixes.

Text of FAA Response: Name of "RAMPS" changed to "WOWAR."

AIRPORTS: FACILITIES AND MAINTENANCE

3. Text of AB: St. Louis, MO, Lambert-St. Louis International Airport: Controller report describes occurrence of frequent incidents at Lambert Field involving taxiing aircraft turning or holding at incorrect taxiways or crossing runways at incorrect points. According to reporter, lack of clear directional and identifying signs requires that controllers issue lengthy instructions to enable aircraft ground traffic to navigate the complex airport runway-taxiway layout; this further congests the already busy radio frequencies. Reporter feels that the absence of adequate markings has led – and will continue to lead – to hazardous confusion on the airport. He recommends that signs be erected to identify all taxiways and runways at Lambert. Previous ASRS reports illustrate other errors caused or exacerbated by the cited marking deficiency.

Text of Airport Manager's Response: We wish to state that a new system of taxiways, including several new taxiways, was completed in December 1979 at this airport, with a plan for new taxiway designation. It was only last week, and in particular, Thursday, May 29, 1980, that the final taxiway designation plan was agreed to by representatives of ALPA, FAA, representatives of airlines serving this airport, airport authority representatives acting for the city of St. Louis, and the airport consulting engineering firm of Booker and Associates. With this final approval we have embarked on a totally new taxiway designation concept, a copy of which is enclosed, and are planning for this work to begin in the very near future. This in turn means design, fabrication, and installation of more than 400 taxiway designation double-faced signs. The office regrets that this work has not been completed, but by necessity will take considerable time for completion. In the present time frame, construction of ramps, taxiways, and runway extensions are 3 to 5 years ahead of master plan projections made 5 years ago. This office specifically requests a copy of this letter and accompanying drawing be sent to all agencies which received your alert bulletin of May 14, 1980. This office has always cooperated in investigating all safety reports from any source whether public or private and will continue to do so even though we feel the controller report does not reflect a true condition.

* * *

4. Text of AB: King Salmon, AK, King Salmon Airport – Controller reports that USAF is operating a jet arresting barrier across the departure end of runway 29 at King Salmon Airport in a manner not in compliance with the provisions of letters of agreement, Air Force regulation 55-42, and an FAA waiver of FAR Part 77. According to reporter, this disregard of procedures affects the safe operation of light aircraft at AKN and constitutes a definite hazard to aviation.

Text of USAF Response: The NASA Alert Bulletin (HATR 80-11-21-ASRS-52) has been discussed and coordinated with the senior King Salmon FAA tower representative and representatives of the 21 TFW and 5071 ABS. During this discussion it was agreed that all arresting gear configuration changes be coordinated between King Salmon tower, 5071 base operations, and the Air Force fire department. It should be noted, however, that operational requirements may dictate arresting gear configurations which are not commensurate with optimum civil air traffic requirements and runway usage. In the event such configurations are required, all actions will be coordinated between the FAA and Air Force prior to implementation.

* * *

5. Text of AB: Newark, NJ, Newark International Airport – Pilot reports deficiency in strength and readability of EWR arrival ATIS for aircraft arriving from south and southwest, as a result of the transmission emanating from Sparta VORTAC, approximately 40 miles northwest of the airport. Citing the need for arriving aircraft to receive the ATIS before commencing descent, reporter suggests that the difficulty might be overcome by recording arrival information on clear channel 132.45 MHz, with departure ATIS on the VOT frequency 110.0 MHz.

Text of FAA Response: Pilot reports of deficiencies in the Sparta ATIS were investigated by the NY Center from 1/16/82 through 1/22/82. Pilots were asked to report on the operation of the ATIS. Approximately 99% of the time the ATIS was reported as normal. The other 1% reported the ATIS as weak. The eastern region evaluation staff (AEA-20) also monitored the Sparta ATIS during flights in and out of NY and confirmed the findings of the Center evaluation. Regional facility maintenance people were also made aware of the reported problem and have been unable to find anything wrong.

AIRPORTS: LIGHTING AND APPROACH AIDS

6. Text of AB: Columbus, MS, Golden Triangle Regional Airport – Pilot reports difficulty in locating airport at night as result of low angle of rotating beacon. According to reporter, there are six airports, three of them with rotating beacons, within a 15-mile radius of GTR. Because of the lack of conspicuity of the GTR beacon, frequent wrong airport landings are made by pilots unable to distinguish the intended airport. Reporter feels that the problem can be corrected readily by merely adjusting the beacon to a higher angle; failing this, he recommends that charts and publications carry a suitable notation of the difficulty in locating GTR under night visual conditions.

Text of Airport Manager's Response: Thank you very much for your Alert Bulletin dated October 1, 1981, concerning the conspicuity of the rotating beacon located at the Golden Triangle Regional Airport. We have been aware of this and have been continually working to get the beacon set properly. We feel that it is at this time. The Alert Bulletin was somewhat in error in the fact that there are only five airports within a 15-mile radius and four of them do have beacons. Additionally, the only two landings I am aware of or the other airports are aware of that were made at the wrong airport were made by a certificated air carrier. One was made at night with a ceiling of 600 ft, visibility 2 miles, and snow at Bryan Field located in Starkville, Mississippi, with a runway length of 5,000 ft. I have never figured out how two pilots could have done that on an instrument approach. The other was made at Lowndes County Airport, which is located just to the east of the Golden Triangle. This was on a perfectly clear VFR night. I can understand this more so than the former.

ATC: FACILITIES AND PROCEDURES

7. Text of AB: Chicago, IL, Chicago-O'Hare International Airport: Pilot reports likelihood of incursion on Runway 9L by jet aircraft in attempting to comply with ORD controller requests to exit Runway 22R at the taxiway short of the 9L-22R intersection. The taxiway-runway angle is too great to meet true high-speed taxiway criteria and the short distance remaining between the 22R turnoff and the 9L hold-short line on the taxiway makes timely stopping difficult. Reporter feels that requests for aircraft to make this turnoff should be issued well in advance of landing and should include clearance to cross 9L if issued to heavy, high-speed aircraft types.

Text of FAA Response: We have discussed the subject aviation safety report with the Air Traffic Division in the Great Lakes Region. They have advised us of the following:

a. When ORD is in an operating configuration in which aircraft landing on 22R may be instructed to hold short of 27R, the ATIS broadcast alerts pilots to that fact and asks them to advise ATC if they will be unable to accept the restriction.

b. The local controller will issue the "hold short" restriction to aircraft landing on 22R *in conjunction with* the clearance to land; i.e., the clearance would be "cleared to land, hold short of Runway 27R."

c. A facility directive governing the conduct of triple approaches states that *no* heavy jet aircraft landing on 22R will be instructed to hold short of 27R.

Clearly the issures raised by the NASA reporter have all been addressed by ORD personnel. The alleged incident in question is obviously a noncompliance with standard procedures for unknown reasons. The regional

Air Traffic Division has been provided a copy of AB 80:28 and will take the appropriate action to emphasize to facility control personnel the need for compliance with standard procedures.

* * *

8. Text of AB: New York, NY, New York Air Traffic Control Center, New York Common IFR Room: Controller reports, referring to a recent letter of agreement between New York Center and N90, contend that the airspace allocations described in the letter do not coincide with the limits of jurisdictional areas delineated on controllers' video maps. Reporters also contend that the new procedures depict an arrival corridor from Carmel VORTAC (CMK) along airway V123 that is too narrow in width to permit required distance of aircraft from the airspace boundaries. Reporters feel that attention should be given to resolving the various problems and inconsistencies that appear to have arisen as a result of the recent changes in this area.

Text of FAA Response: Regarding the subject report, some airspace boundaries (geographical coordinates) were modified slightly in the May 15, 1980 Center/CIFRR Letter of Agreement. The CIFRR video maps were not redrawn at that time because they were in the process of a major revision of all maps. Most of the modifications did not affect separation standards because their current maps provide *more* than the required distance between areas. Only three areas necessitated clarification for separation purposes. The CIFRR issued a Facility Notice on June 2, 1980, identifying these lines and outlining the required separation. The procedures and airspace limits within the Carmel arrival corridor were *not* changed and have always allowed standard airspace protection from adjacent facilities.

* * *

9. Text of AB: Atlanta, GA, Atlanta Air Route Traffic Control Center – Pilot reports receipt of a clearance from Atlanta Center to hold at Sinca intersection at FL280 shortly after he had heard an aircraft ahead of him receive an identical clearance. After repeated objections – and refusal to accept the clearance – by both pilots, Center amended the holding altitude of the leading aircraft to FL270. According to reporter, the policy of clearing two aircraft to the same holding fix at the same altitude is common at ZTL; he considers it unacceptably hazardous because of the potential risk of conflict in the event of Center radio failure. Reporter recommends that the procedure of clearing more than one aircraft into the same holding pattern at the same altitude be discontinued.

Text of FAA Response: Clearing aircraft to the same fix without regard to assigned altitude, while the aircraft are some distance out from the hub fix, is a planning tool often used to manage traffic flows and meet airport acceptance rates. More importantly, it reduces the frequency congestion that would result if all pilot/controller delay communications were accomplished close into the holding fix after the picture of who fits where becomes perfectly clear. These planning clearances should not be confused with the controller's overriding responsibility to establish and maintain either vertical, longitudinal, or lateral separation between aircraft as required by FAA Handbook 7110.65. Since aircraft are descending through each other's altitude as they near any clarance limit (even if they are assigned different altitudes to maintain), the pilot/controller communication capability is critical. For that reason, several levels of redundancy and alternate methods of air-to-ground communication have been built into the ARTCC method of operation.

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10. Text of AB: A controller report describes an occurrence involving radio failure in an aircraft during the conduct of an instrument approach – after missing his approach, the pilot executed both the missed approach and the lost communication procedures, flying to his intended alternate airport. Reporter contends that approach control had no knowledge of the filed alternate airport, requested route, or altitudes to be flown, and that existing methods for handling of flight plans fail to provide a means for dissemination of this

information. According to reporter, current doctrine does not require the forwarding of alternate airport information by flight service stations, thus depriving ATC of information necessary to permit safe separation for an aircraft suffering communication loss when it is forced to divert to an alternate destination. He contends further than there is no practical method for obtaining this information when required, since no knowledge is available as to the original FSS filing point. Reporter recommends that alternate airport data be included in proposed IFR flight plans forwarded by FSS to ATC and that such data be made available to all controllers who may be concerned with the planned flights. Absence of this information, particularly in a non-radar environment, may lead to potentially hazardous traffic conflicts.

Text of FAA Response: The air traffic service is in the process of developing a rule project which will propose revising FAR 91 by requiring pilots to file the proposed route to the alternate airport. Should such a rule be adopted, the air traffic service will investigate the various procedural options and take action to insure that the information is made available to the appropriate controllers.

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11. Text of AB: Atlanta, GA, Hartsfield Atlanta International Airport – A substantial number of reports have been received relating to potential conflicts between aircraft descending inbound to ATL on the La Grange arrival via ATL radial 228 and departing aircraft climbing on the reciprocal heading. Typically, an altitude deviation by a descending aircraft results in its being placed headon to a climbing aircraft; the ATC-intended altitude restrictions under these circumstances appear to be insufficient to prevent loss of required separation. Reporters note the hazard potential inherent in procedures that place inbound descending and outbound climbing opposite direction traffic on the same track and recommend that departure traffic be vectored on headings that will provide lateral separation to augment the specified altitude separation between arriving and departing traffic. Other reports indicate that the ATL situation described in this Alert Bulletin is duplicated in other terminal locations; similar recommendations have been made in those other cases. The common theme of the various reports suggests that any attention to the issue should not be restricted to the ATL situation.

Text of FAA Response: There is no charted procedure at the Atlanta Airport requiring departures to fly outbound on the ATL 228 radial. Departures proceeding on course to the west are normally radar vectored and cross under the La Grange arrival traffic approximately 10 miles southwest of the airport. This safety bulletin has been reviewed by ATL ATA interests, the ATL tower and southern region. All parties are satisfied with the procedures at ATL as they relate to this crossing departures under arrivals issue. No further action is required.

* * *

12. Text of AB: Front Royal, VA, Front Royal VORTAC; Winchester, VA, Winchester Municipal Airport – Controller reports that during construction associated with the relocation of FRR VORTAC from Front Royal to Winchester Airport (after relocation the facility is to be renamed "Shawnee") there have been – and continue to be – long periods when FRR VOR signals are being transmitted, with DME (TACAN) information being transmitted from the Shawnee site. Despite NOTAMS stating that only one of the locations would be active at one time, testing continues to take place with both facilities transmitting, and with DME information emanating from a site 4.5 miles away from the FRR origin of radial information. Reporter contends that the situation is confusing and hazardous for pilots attempting to use the facility for navigation, and that a particularly hazardous potential exists for pilots executing instrument approaches to Winchester, where DME information is a vital part of the procedures. Reporter recommends prompt measures to eliminate the propagation of false and misleading signals at these locations in order to remove the possibility of serious pilot navigation errors.

Text of FAA Response: Relocation of the Front Royal, VA VORTAC was completed on December 25, 1980, and the possibility of simultaneous transmissions no longer exists.

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13. Text of AB: Atlanta, GA, Atlanta Air Route Traffic Control Center – Earlier ASRS reports have cited potential conflict occurrences during which conflict alert was apparently either suppressed or ignored by controllers. A recent report augments and amplifies these earlier reports. Reporter contends that a study of conflict alert data by computer personnel has disclosed a widespread practice by controllers of suppressing conflict alerts, often followed by loss of standard separation which is not reported as a system error. Reporter expresses concern that a serious conflict situation may occur during a period when a controller has suppressed the conflict alert display function.

Text of FAA Response: The conflict alert function does by its early warning feature frequently result in warnings to controllers after they have already issued clearances to maintain separation. Since conflict alert causes the data block to flash, it is beneficial to permit the controller to inhibit conflict alert when the above condition exists or after clearances are issued to provide separation. Conflict alert also triggers between VFR aircraft being tracked and military operations for which the air traffic control system is not providing separation. Thus, the controller must be free to inhibit such nuisance alerts. We are, of course, aware of a few situations in which the controller apparently issued control instructions, then inhibited the conflict alert function and the control instructions were inadequate to avoid a system error. A review of national operational practices and procedures is underway which should result in guidance which will further minimize such occurrences. A review of conflict alert data by anyone not thoroughly versed in the function and the printouts can result in the erroneous impression that system errors have occurred and not been reported. Accurate determinations of this nature could only be made by additional study and correlation with voice tapes.

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14. Text of AB: Kansas City, KS, Fairfax Municipal Airport – Air traffic controller contends that complaints have been received over a considerable period of time relating to poor radio communications in the southwest quadrant of the Fairfax traffic pattern. Reporter believes that interference with ground/air communications is caused by local broadcasting stations in the area southwest of the airport and recommends investigation of the situation in the interest of safety of flight.

Text of FAA Response: The text of the above subject Alert Bulletin is accurate. This problem with electromagnetic radiation interference caused by high-powered FM stations located in close proximity to Fairfax Airport has been under study for several months. The resolution to this problem is underway at this time. The specific cause of interference on the tower frequency will be corrected by changing the local control frequency from 126.3 MHz to 128 MHz. Personnel from the frequency management staff working with electronic engineers have, after arduous research, identified this new frequency as one which will reject harmonic distortion from nearby FM stations. For several months there has been a permanent NOTAM listed in the airport directory advising pilots of potential interference problems at Fairfax. This NOTAM will be continued in effect for the next 90 days, or until we are assured that the problem is resolved.

* * *

15. Text of AB: Anchorage, AK, Anchorage Air Route Traffic Control Center – A continuing series of controller reports, commencing in August 1980, have been received by ASRS contending that tracking performance of the enhanced automatic radar tracking system (EARTS) at Anchorage Center is inconsistent and thus unsatisfactory. The reports describe incidents involving track swaps, coasting data blocks, unexplained

system failures, erratic course indications, and false aircraft position indications. According to reporters, more than one long-range radar site (Kenai and Middleton Island) contribute to the alleged problems. Reporters suggest that use of EARTS for radar separation of aircraft be discontinued until the causes of the problems have been identified and rectified. Pending correction of the difficulties reported, reporters feel that geographic areas subject to error occurrence should be clearly defined and marked on the video map.

Text of FAA Response: The EARTS system's performance is operationally acceptable and safe. There have been problems both within the tracking software and the hardware providing target data to the EARTS system. In response to specific problems identified in the EARTS software, careful studies to determine the exact nature of the problems were done and modifications have been incorporated into the software to eliminate problems as the causes were discovered. Research is continuing in an attempt to further improve all aspects of the EARTS tracking software. The airway facilities service has also responded to specific problems identified with ARSR's and common digitizers (CD) with teams from the FAATC. Modifications have been made to the Kenai and Middleton Island ARSR's and the common digitizer at the Murphy dome site.

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16. Text of AB: Lynchburg, VA, Lynchburg Municipal Airport – Reporting controller calls attention to the missed approach procedure as published on the approach plate for the ILS Runway 3 at LYH. The procedure prescribes a climb to 1,500 ft followed by a climbing right turn to 3,500 ft via 080° heading . . .; The turn, commenced at 1,500 ft, places an aircraft in close proximity to a charted obstruction (mountain with antennas) shown as 1,425 ft and located just northeast of the airport. Reporter suggests that this procedure could be hazardous and suggests that it be amended to allow missed-approach aircraft to climb to 2,000 ft before executing the right turn to 080°.

Text of FAA Response: A copy of the attached Alert Bulletin was sent to the ACY FIFO, along with our request to recheck the missed approach procedure as published on the ILS Rwy 3, Lynchburg, Virginia. The procedures section, ACY FIFO, found the missed approach to be in accordance with TERPS criteria. The missed approach procedure had been changed at the request of air traffic control (ATC) by the ACY FIFO on October 22, 1980, and published as amendment 10 on January 22, 1981, attached. The procedures section, ACY FIFO, has received no further request for change from ATC.

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17. Text of AB: Tucson, AZ, Tucson VOR, and Davis-Monthan AFB RAPCON – Reporting controller, citing a recent traffic conflict, notes that the radar antenna for DMA RAPCON is located 3 miles northwest of TUS VOR and that the radar antenna blind spot includes an area intersected by several airways. As a consequence, DMA radar controllers are often unable to see aircraft targets operating in the antenna blind spot and conflicts result. Reporter suggests that TUS VOR be relocated to a site on Tucson International Airport. This would cause realignment of the airways to the west and south of the radar antenna, providing improved airway radar coverage. It would also provide for increased usage of TUS VOR as a NAVAID for Tucson International arrival and departure traffic.

Text of FAA Response: The Western Region Planning Branch, AWE-510, has advised that the Tucson VORTAC is scheduled for relocation to the Tucson International Airport during March 1983. The airways will be realigned and the present Tucson VORTAC will revert to an LVOR concurrently with the commissioning of the new VORTAC. Applicable new procedures are scheduled to be developed by May 1982.

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18. Text of AB: Robbinsville, NJ, Robbinsville VORTAC – Pilot reports that performance of RBV VORTAC has been unsatisfactory on several recent flights, made in different aircraft. Specifically, excessive needle swing and difficulty in establishing an inbound radial are noted. Reporter cites a flight during which an abrupt needle swing from side to side caused him to notify ATC that the apparently faulty signals induced doubt in his mind concerning his true position in the assigned RBV holding pattern. He was advised by ATC that his radar position indicated a considerable deviation from the limits of the pattern. Reporter states that unsatisfactory transmission from the facility has persisted for some time and that other pilots have made similar complaints. He feels that the high traffic density in the New York area urgently dictates reliable operation of RBV and that steps should be taken to eliminate the problems.

Text of FAA Response: We have reviewed your June 18, 1981, letter and the Alert Bulletin. Our analysis of the performance of the Robbinsville VORTAC shows no outages or complaints during the last six months and one outage during the past 12 months. The outage occurred on July 6, 1980, during a commercial power failure. In addition, the results of the last periodic flight inspection (January 6, 1981) and a special flight inspection (April 13, 1981) confirm satisfactory operation of the subject facility. The current airport/facility directory lists the following restrictions on this VORTAC: 1) Unusable – 315 deg – 335 deg below 9,000 feet. 2) Unusable – 335 deg – 360 deg beyond 20 NM. Neither your letter nor the Alert Bulletin identified the specific location of the aircraft during the alleged discrepancy. We would require the range, azimuth and altitude of the aircraft, in order to evaluate the complaint. Furthermore, lacking this specific information, we have concluded that the Robbinsville VORTAC is operating normally and within all standards and specifications.

HAZARDS TO FLIGHT

19. Text of AB: Denver, CO, Denver Air Route Traffic Control Center – Reporting controller describes a recent potential traffic conflict between a climbing air carrier aircraft, and a parachute jump aircraft in the vicinity of Strasburg. According to reporter, parachute jumping takes place in this area at specified times and under specified conditions, but in the reported incident these conditions were not met. Reporter feels that such activity in the vicinity of a metropolitan airport and on an airway is a hazard to flight and recommends that the Strasburg jump area be relocated away from any airway.

Text of FAA Response: This Alert Bulletin does not indicate if regulations were violated or if established procedures were not followed; only that specified conditions were not met. Under FAR 105, in controlled airspace, parachute operations must be preceded by traffic advisories received by the jump aircraft prior to jump. In addition, for repeated jumps, FAA Handbook 7210.3F "Facility Operation and Administration" encourages facility/user pre-coordination efforts with all responsible persons, including letter of agreement.

MILITARY–CIVIL COORDINATION

20. Text of AB: Vicinity of Kemmerer, WY, IR 499 – Reporter expresses serious concern over hazardous potential conflict situation involving high-speed military bomber traffic on IR 499 and civil helicopters engaged in petroleum exploration activity. Substantial numbers of helicopters traverse the area at altitudes varying from 300 to 1,000 ft above the terrain; frequently they trail long cables attached to explosives intended for delivery to exploration sites. The military aircraft often fly at altitudes of 500 ft and lower; their speed, in conjunction with the concentration required by the helicopter pilots on their precision tasks tends to decrease the effectiveness of ordinary see and avoid technique. Reporter recommends that the floor

of the IR be raised to a minimum height of 1,500 ft above the terrain, or that the route be relocated during the period – expected to last approximately 2 years – of the exploration activity.

Text of USAF Response: 1) SAC has made a review of the AB and has taken the following actions: A) Aircrews who are scheduled to fly IR-499 are briefed on the helicopter traffic in the vicinity of Kemmerer, WY. B) Normal flying hours of 09:45 PM to 03:45 AM local have been established for aircraft to fly the route. Some aircraft (8–10 flights per week) may fly the route during daylight hours. C) Aircraft are restricted from flying lower than 600 ft above the ground (AGL) during the day and 800 ft AGL at night under VFR conditions. They fly 1500 ft AGL or higher under IFR conditions. 2) The reporter's recommendation to increase the floor or move the route would negate the usefulness of the IR. IR's are established to permit the military to fly low over the terrain. IR-499 became operational 5 Apr. 76. It has proven to be a valuable route. 3) The second recommendation of closing the route would not be practical. That portion of the route which would need to be moved is associated with a radar tracking site. The area was selected because of the radar operational capability, cultural/terrain features and environmental considerations. 4) The low level in the Little America area provides the realistic training SAC combat-ready crews need on the type of missions they would fly in a national emergency. The aircrews fly the route only under an IFR clearance from FAA. The safety of aircrews at low level continues to be a major concern. Therefore, we encourage wide dissemination of knowledge of flight operations. The times the route is flown are available at the Rock Springs Flight Service Station (FSS). Suggest the helicopter traffic contact the FSS for advance information of traffic.

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13. NASA Aviation Safety Reporting System, Quarterly Report No. 13, NASA TM-81274, 1981.

LISTING OF ASRS PUBLICATIONS AVAILABLE

Following is a list of publications produced by NASA's Aviation Safety Reporting System Office. These publications may be requested (subject to stock availability) through: NASA ASRS, P.O. Box 189, Moffett Field, CA 94035.

Title	Publication Status	
	Date	Medium
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Details of Administration and Results to Date of the Aviation Safety Reporting System	12-76	QR-2
Factors Associated With Altitude Overshoots, Excursions, and Undershoots	05-77	QR-3
Misunderstandings of Communications Between Pilots and Controllers	05-77	QR-3
Operational Problems in Terminal Radar Service Areas: A Review of ASRS Data	10-77	QR-4
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Human Factors Associated With Potential Conflicts at Uncontrolled Airports	08-78	QR-7
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Distraction – A Human Factor in Air Carrier Hazard Events	06-79	QR-9
Summary of the Characteristics of the ASRS Database	06-79	QR-9
Human Factors in Air Carrier Operations: Knowledge of the Limitations of the ATC System in Conflict Avoidance Capabilities	04-80	QR-10
A Study of Near Midair Collisions in U.S. Terminal Airspace	08-80	QR-11
Potential Effects of the Introduction of the Discrete Address Beacon System Data Link on Air/Ground Information Transfer Problems	03-81	CR166165
Fatigue and Associated Performance Decrements in Air Transport Operations – An Aviation Safety Reporting System Study	03-81	CR166167
Problems in Briefing of Relief by Air Traffic Controllers	12-80	QR-12 TM81252
Altimeter Reading and Setting Errors as Factors in Aviation Safety	12-80	QR-12

Title	Publication Status Date	Medium
The Go-Around Maneuver in Air Carrier Operation: Causes and Resulting Problems	09-81	QR-13
Information Transfer Between Air Traffic Control and Aircraft: Communication Problems in Flight Operations	09-81	TP1875
Information Transfer in the Surface Component of the System: Coordination Problems in Air Traffic Control	09-81	TP1875
Information Transfer Within the Cockpit: Problems in Intracockpit Communications	09-81	TP1875
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A Study of Flight Crew Performance When Pilot Flying and Pilot Not Flying Duties are Exchanged	06-82	CR166433
Addressee Errors in ATC Communications: The Call Sign Problem	01-83	CR166462
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16. Abstract

This is the fourteenth in a series of reports based on safety-related incidents submitted to the NASA Aviation Safety Reporting System by pilots, controllers, and, occasionally, other participants in the National Aviation System (refs. 1–13). ASRS operates under a memorandum of agreement between the National Aviation and Space Administration and the Federal Aviation Administration.

The report contains, first, a special study prepared by the ASRS Office Staff, of pilot- and controller-submitted reports related to the perceived operation of the ATC system since the 1981 walkout of the controllers' labor organization. Next is a research paper analyzing incidents occurring while single-pilot crews were conducting IFR flights. A third section presents a selection of Alert Bulletins issued by ASRS, with the responses they have elicited from FAA and others concerned. Finally, the report contains a list of publications produced by ASRS, with instructions for obtaining them.

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